2004 GALVESTON BAY INVASIVE SPECIES RISK ASSESSMENT
INVASIVE SPECIES SUMMARY

Created by: Environmental Institute of Houston, University of Houston-Clear Lake
and the Houston Advanced Research Center

Common Name: Argentine ant
Latin Name: *Linepithema humile*
Category: Terrestrial Animal
Place of Origin: Argentina and Brazil
Place of Introduction: "New Orleans, by 1905 had traveled to Carolinas, Southern Florida, Texas, Arizona and California (http://ag.arizona.edu/urbanipm/insects/ants/argentineants.html)."
Date of Introduction: 1891
Life History: "This ant is only about one sixteenth of an inch long, light to dark brown in color. Antennae consist of twelve segments and the thorax joins the abdomen by a thin stalk like pedicel. The soldiers of the colony are slightly larger with big, muscular heads and sword-like jaws. If many ants are squashed at one time a musty, greasy smell is detectable. The argentine ant does not sting, they can bite, though are too small to inflict a painful bite to humans. Male ants hatch from unfertilized eggs. Their life span lasts about one year during which their only role is to mate with queens. The majority of fertilized eggs hatch into sterile females, which become workers. All workers generally live about four years. The smallest Argentine ant workers become nurses. These ants care for the eggs, larvae, pupae, and young ants. Other roles of the Argentine ant colony are unique; some worker ants sneak into other ant colonies and steal eggs (this is known as slave-making), and some worker ants herd aphids and collect the honeydew they secrete for food. Colonies may consist of hundreds to thousands of members. The queen ant's role is to mate with male ants in the nest. Unlike other species, Argentine ants rarely swarm. After mating new queens will leave the nest with a band of workers to start a new colony elsewhere, this is a process known as budding. This tiny ant is extremely unique; their social order, feeding and communication technique is different from other ant species. Adult ants have a very thin esophagus and cannot swallow large particles of food. As a result they have developed a complex feeding technique. Worker ants chew the food they have foraged, the food is then passed on to the larvae, which digest and regurgitate it back for the adults. Individuals are thus interdependent on each other. Furthermore, an argentine ant has 2 stomachs, one stomach for its own digestion, the second is the crop that is used to feed other adults. Whilst ants pass food to each other they also communicate this way by passing chemical messages known as pheromones along with the food. The pheromone secretions are in a form that can be sensed chemically. The messages communicate required tasks. Pheromones are also used to attract mates, sound alarms, and provide food trails from the nest among other purposes. It is also suggested that these secretions create a bond or friendship between colony members, encouraging cooperation. Each nest has its own distinct smell and so ants can recognize each other. For this reason, no individual can become a member of a different colony separate from the one in which it developed. Argentine ants have a special social structure. While most ant colonies have only one queen, argentine ants can have as many as eight queens for every 1,000 workers. Argentine ants also cooperate with different colonies of the same species instead of competing with them. During fall, outside colonies may even join together, temporarily to form large overwintering nests. Their social system is an advantage to the Argentine ant, as a result they are consistently better than native ants at exploiting food sources. Argentine ants also forage for longer periods throughout the day in higher numbers than many native ant species. Argentine ants are extremely aggressive to other insects and when introduced into a new territory they drive out or kill all of the native ants. They produce iridomyr-mecin, a toxic chemical that is smeared on enemies to kill them or force them to retreat. Argentine ants are relentless and simply outnumber their adversaries until the enemy colony is exterminated. In this manner they can overtake other insect species, including larger stinging ants, termite colonies and even kill or drive off paper wasps and carpenter bees (http://ag.arizona.edu/urbanipm/insects/ants/argentineants.html)."
Growth/Size: 1/16 of an inch long (http://ag.arizona.edu/urbanipm/insects/ants/argentineants.html)
Feeding Habits/Diet: "Worker ants forage for sweet food and just about any organic matter they can find. They are essentially scavengers, though 70% of their diet is made up of honeydew, the sweet sugar exuded by aphids, mealybugs, whiteflies, leafhoppers and other sap-sucking insects. The Argentine ants will herd these insects and protect them from natural predators (http://ag.arizona.edu/urbanipm/insects/ants/argentineants.html)."
Habitat: "Although they prefer to be outdoors, they occasionally enter houses for food and water, and in the fall for warmth. Most commonly, however, they are found in the first six feet of moist soil, sheltered underneath buildings and by sidewalks. Sometimes

colonies develop in potted plant soil. Nests are constructed from rocks, twigs and dirt. Argentine ants relocate their nests often in response to food sources and temperature (http://ag.arizona.edu/urbanipm/insects/ants/argentineants.html)."

Attitude (aggressive, etc.): "The Argentine ant is capable of being extremely invasive due to several biological factors: it has a wide dietary range, establishes large continuous "unicolonies" with high densities of noncompeting nests, and produces large numbers of aggressive and industrious workers. When established in optimal habitat, if often nearly or completely excludes all other ants, native and introduced (http://www.hear.org/hnis/reports/HNIS-LinHum.pdf."

Physical Description: "Workers of this species are small, medium to dark brown ants, reaching 2 to 3 mm in length. Body surface is smooth and shiny, and lacks hairs on the dorsum of the head and thorax. The petiole is composed of a single, scale-like segment, and sting is absent. Workers are extremely fast moving and industrious, often recruiting in high numbers (http://www.hear.org/hnis/reports/HNIS-LinHum.pdf)."

Management Recommendations / Control Strategies: include references for existing site-specific strategies

"PESTICIDES, HORMONES

Much money has been spent on researching and developing chemicals for control and/or eradication of the Argentine ant, due mostly to its ability to become a pest for homeowners and crop growers. Efforts have focused mainly on insecticides applied in a variety of methods, although growth hormone analogues and semiochemicals have also been studied less extensively. At this point, biocontrol is not regarded as an option.

The history of Argentine ant control efforts is a long one. Although the ant was first seen in the U.S. in New Orleans in about 1891 (Newell 1908), it wasn't until it appeared in California in 1907 that action was proposed. Its potential threat to the California citrus industry was first suggested by the University of California in 1908 (Haney 1984). Soon after, as early as 1913, control efforts involving pine tar bands around tree trunks, moats around trees, and trap boxes were implemented in citrus groves. Later, managers began fumigating with carbon bisulfides, hydrogen cyanide gas, pyrethrum powder and arsenic syrup (Haney 1984).

As newer chemicals became available later in the century, control efforts were renewed, often on a larger scale. In 1972 granular Chlordane was being applied at 100 lbs/acre, which allowed larger areas to be treated (Haney 1984). However, in 1979, Chlordane was outlawed. The insecticide Diazinon was still available, although the recommended method of use was to apply the granules directly to nests. This was not very practical or cost effective. At about the same time, Markin et al. (1974) found that the aerial spraying of Mirex in a 1000 ha plot in Louisiana reduced the numbers of *Solenopsis invicta* by 98%, but had no effect on *L. humil*e. Subsequently, Haney (1984) used liquid Diazanon and liquid Lorsban as a spray around the base of trees and found that this method controlled 97% of the colonies in the citrus grove.

While research in California focused on control in citrus and other agriculture, pest managers in Australia tended to focus more on eradicating or controlling the ant in urban areas. The ant was first recorded in Victoria in 1939, Western Australia in 1941, and New South Wales in 1950 (Jenkins and Forte 1973). In 1945 DDT was first used as a barrier spray for houses and orchards, and in 1950 an effort was undertaken to eradicate the ant from the city of Fremantle using a blanket spray of DDT. In 1954 the Argentine Ant Act was passed, a campaign headed by the Department of Agriculture designed to eradicate or control the ant in large urban and rural areas (Jenkins and Forte 1973). Subsequently 31,000 ha of Argentine ant territory was sprayed with DDT, chlordane, dieldrin and later heptachlor. It was reported that the Argentine ant was successfully eradicated from most of this area (van Schagen et al. 1994). In 1962, the New South Wales Government passed the Argentine Ant Eradication Act with the specific objective of removing the ant from Sydney and Wollongong using chlordane (Pasfield 1968). None of these campaigns were completely successful in eradicating the ant, but did reduce numbers to more acceptable levels. However, all of these chemicals eventually became illegal, with heptachlor being banned in 1988 (van Schagen et al. 1994). For more updated information on control efforts in Australia, see Whitehouse (1988) and Majer (1990).

While some of the above mentioned control efforts provided some relief from the adverse effects of the Argentine ant, all of the chemicals discussed have since been outlawed. Meanwhile, a few other classes of chemicals have been studied. Edwards (1986) investigated the efficacy of the insect juvenile hormone analogue methoprene on several pest ants. While he found it to be very effective against the pharaoh ant *(Monomorium pharaoni*s), it was generally ineffective against Argentine ants because they were inconsistent in their choice of baits (Edward 1986). Shorey et al. (1992) used semiochemicals and related pheremones to disrupt foraging behavior in the Argentine ant, and found the chemical farnesol to be the most effective. This type of control, however, is only useful for excluding foraging workers from specific target areas, such as citrus trees.

Methods of the most relevance for controlling the Argentine ant in Hawaii involve toxicants broadcast on a large scale, with the intent of eradication (as opposed to repellent perimeter treatments used for homes, orchards, or single trees). As chemicals of the past have fallen out of use, the most recent research has focused on newly developed toxicants. One of these, hydramethylnon, is commercially formulated in the baits Maxforce and Amdro. Forschler and Evans (1994) found that they were able to eliminate Argentine ants from an apartment complex in Georgia using Maxforce. Their study also found the bait Pro-Control, containing the active ingredient sulfluramid, to be effective, but less attractive and slower working than Maxforce. While they distributed these baits in spot containers, Maxforce is also available in granular form and can be broadcast on a larger scale for controlling larger infestations. In fact the bait Amdro, a corn grit based carrier formulated with the active ingredient hydramethylnon, was used to completely eradicate a 2 to 3 ha infestation of the little fire ant, *Wasmannia auropunctat*a, from Santa Fe island in the Galapagos (Abedrabbo 1994). This appears to be the most promising tool at this time, although new toxicants are currently being developed (http://www.hear.org/hnis/reports/HNIS-LinHum.pdf)."

References (includes journals, agency/university reports, and internet links):

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